PROSPECTUS

FOR

KIMPO INTERNATIONAL AIRPORT

EXPANSION PROJECT

October, 1971

The Government of the Republic of Korea

Seoul, Korea

PROSPECTUS

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Summary of Project

1. Project Title: Kimpo International Airport Development Project

2. Project Sponsor: Ministry of Transportation

3. Estimate Project Cost:

   Foreign Exchange Cost: US$27.240.200.

   Local Currency Cost: 14.143.200.000 Won

   Total : US$64.955.400.

4. Project Description:

The aim of the project is to develop the Kimpo site to satisfy all forecast commercial needs through 1990. To meet the projected peak hour operation capacity of 59 for both domestic and international traffic in 1990, the existing airfield has to be expanded. Also in order to schedule planning, make construction financing more acceptable to lending institutions, and to minimize the possibility of unwarranted financial burdens, the expansion program is suggested in two basic phases as follows:

PHRASE I (1972 - 1975)

Project	Year to be completed	Scale (m^2)
Full Parallel Taxiway	1974	132.000
Repair of Existing Pavement	1973	212.000
New Apron Space Construction	1973	157.000
Terminal Facilities expansion	1975	10.000

PHASE II (1976 - 1980)

Project	Year to be Completed	Scale
Full Parallel Runway	1980	3200 m × 45 m
Expansion of the Newer International Facility	1978	18.000 m^2
Further expansion of the Present Terminal (Domestic)	1978	21.000 m^2
Construction of a Cargo Terminal	1980	6.400 m^2

5. Project Benefits

The project is economically justified because the benefit-cost ratio of 3.7 as well as excess benefits of US$99.588.000 results from the economic study for the project as shown below:

Annual Benefits:	US$136.128.000
Annual Costs:	US$ 36.540.000
Excess Benefits:	US$ 99.588.000
Benefit-cost Ratio:	3.7

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Section I Kimpo - Present Facilities

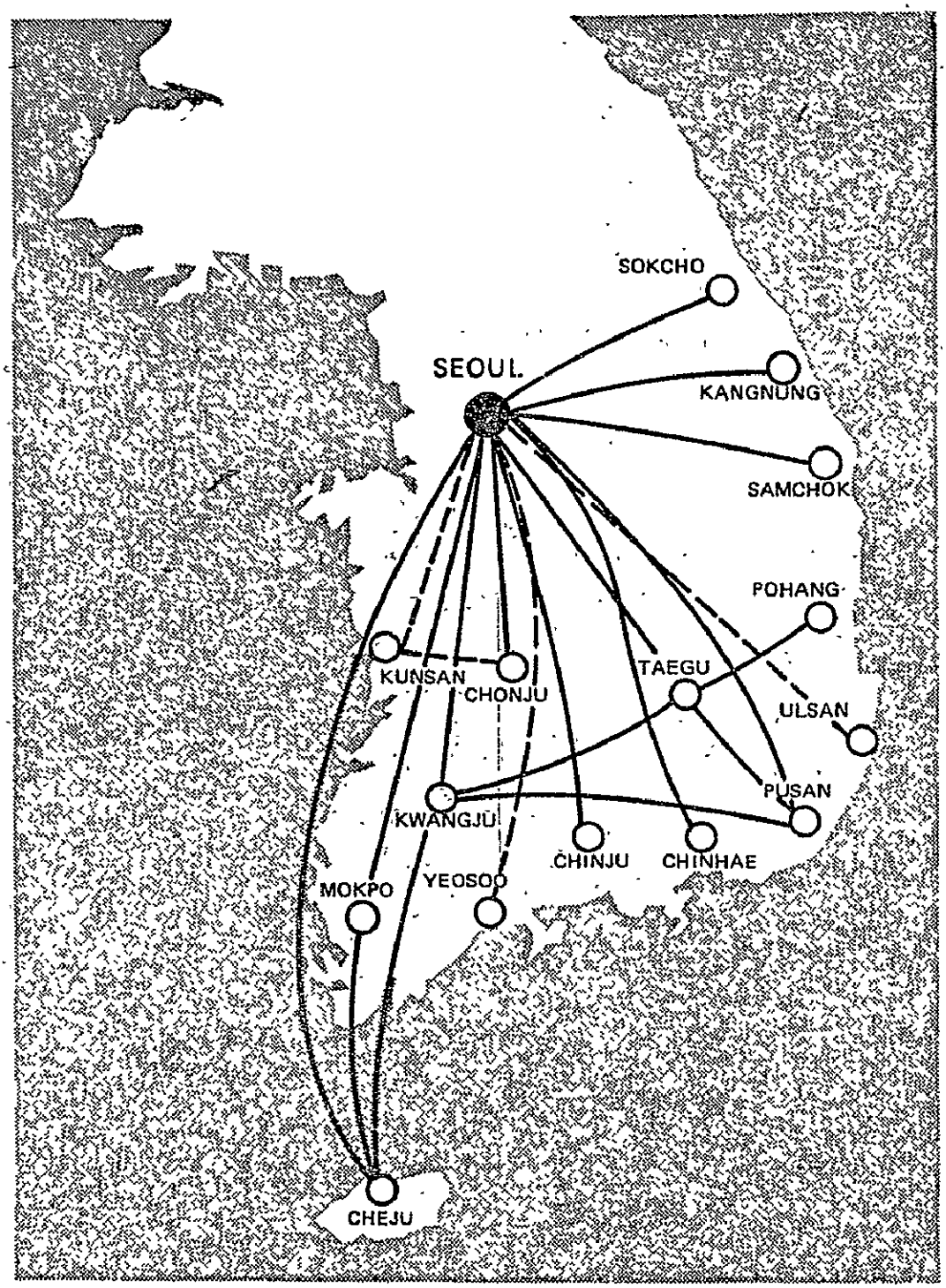
1. Introduction

Kimpo, Korea's major international airport, is the center of commercial aviation within the Republic. In addition, it is one of the Orient's major air centers, serving as the gateway to the nation and to the capital city of Seoul. International flag carriers, including Korean Air Lines, link Kimpo to the adjacent capitals of the Orient and Southeast Asia, as well as to European and North American continents. Korea's own national airline, KAL, provides scheduled service to Japan, Formosa, Hong Kong, South Vietnam and Thailand. All of KAL's service originates or terminates at Kimpo. Domestic route structure is also based on operation to and from Kimpo International Airport. Kimpo is the physical heart of Korea's civil aviation activity.

2. Location and General Data

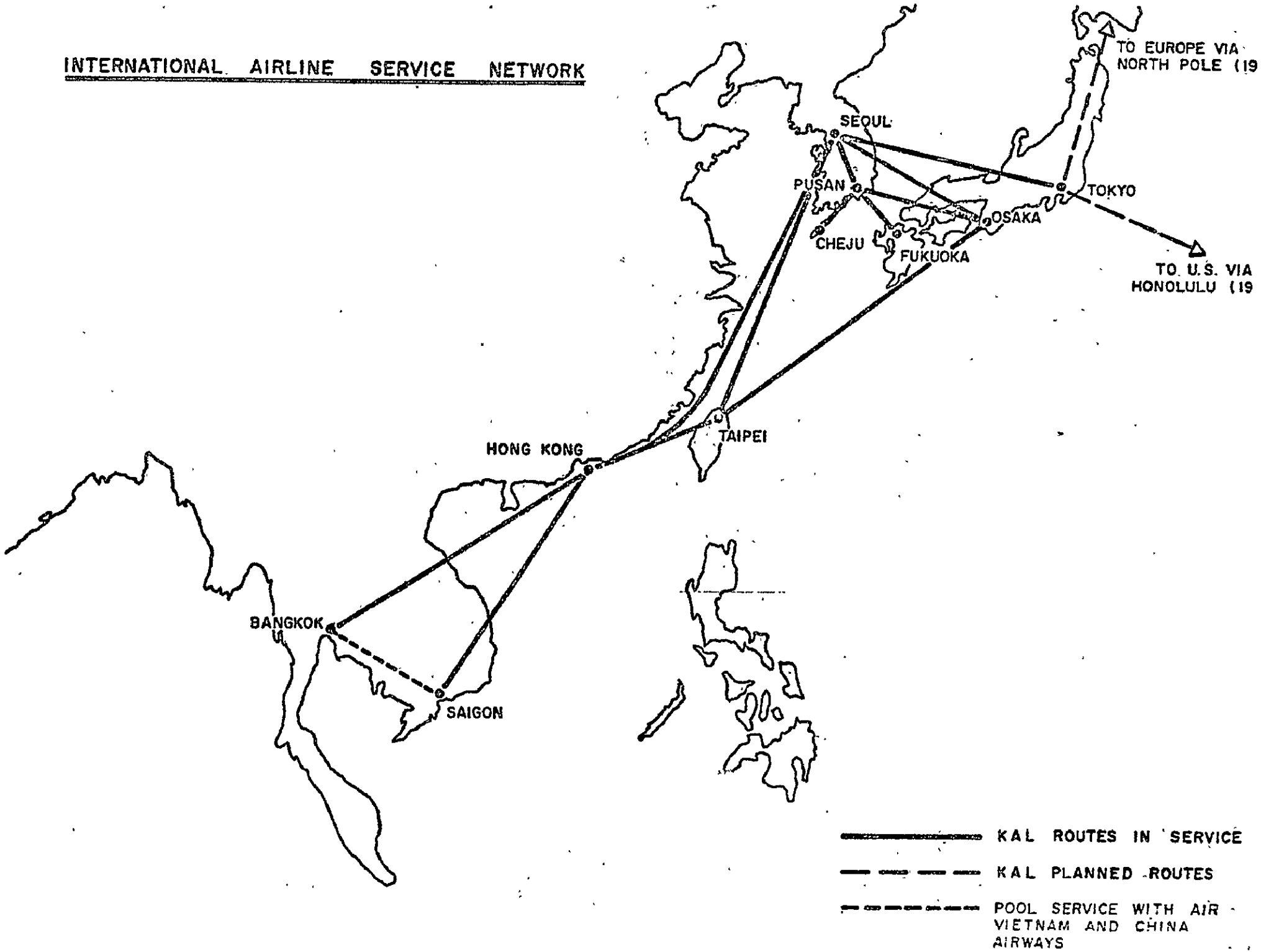
Kimpo International Airport is located approximately 17 km by highway west of City Hall Plaza, the commercial and hotel center of the City of Seoul. Its Reference Point is located at Latitude $37^{\circ}33'$N, Longitude $126^{\circ}48'$E, and its elevation is 19 m (64 feet) mean sea level.

The airfield is operational on a twenty-four hour per day basis. The airport administrative authority is the Civil Aviation Bureau of the Ministry of Transportation. There are Republic of Korea Air Force (ROKAF) and United States Air Force (USAF) installations at Kimpo.



DOMESTIC ROUTE STRUCTURE

INTERNATIONAL AIRLINE SERVICE NETWORK



Aircraft fuel and lubricants are available. No hangar facilities are available. The only hangar facilities are those of Korean Air Lines.

Repair facilities (minor repairs) are available on a 24 hour prior notice basis. Cargo handling facilities and services are available only on a prior arrangement basis.

3. Airport Access

Presently the major access road from Seoul to Kimpo is highway number 6 from Han-gang-gyo 2 (Seoul second bridge) to the airport site. Travel distance from the bridge to the airport entrance gate is approximately 11.8 km. Travel distance by automobile from City Hall, Seoul to the airport site is approximately 19 km and travel time is one-half hour. There is public bus and taxi services to the airport.

The airport access road from the Seoul second bridge is six lanes for the first 1.9 km. The remainder of the highway to the airport toll gate is effectively eight lanes and is divided in the center by a one meter median. Speed limit on this highway is 80 km per hour.

Assuming that this highway is capable of handling traffic at the capacity of approximately 6400 vehicles per hour at running speeds of 60 to 80 km per hour, the airport access road appears to be suitable for the use today. It is not felt that additional construction on the present access road is warranted by the air traffic forecasts.

4. Airport Facilities

a) Runway: 2,470 m × 45 m

Asphalt with 65,000 lbs SIWL (Single Isolated Wheel Load)

Both the longtitudinal and transverse deflection or reflection cracks are observed throughout the whole surface of the runway, which are probably caused by original subgrade weakness.

b) Taxiways: Three active taxiways designated as "B", "C", and "D" for commercial use.

All pavement is asphaltic concrete.

i) "B" Taxiway: 720 m × 22.5 m

It shows the heaviest signs of deterioration. The asphaltic concrete pavement strength is weak. Therefore, it is only used for the lighter domestic aircraft, YS-11 and F-27, used by KAL.

ii) "C" Taxiway: 300 m × 22.5 m

It also shows signs of pavement distress and failure. The centrally-located "C" taxiway serves as the primary access to the runway from the apron areas, which almost every larger, international aircraft is using.

iii) "D" Taxiway: 90 m × 22.5 m

This taxiway shows the same distress as "C" taxiway. Since it is located on the north-west end of the runway, this taxiway is primarily used by KAL for aceess to the domestic apron area.

c) Apron:

The civil aircraft parking apron was essentially developed from prior paved areas without a coordinated plan. It is approximately 120 meters wide by 600 meters long. The surface is asphaltic concrete and is relatively flat and poorly drained. Many randoms, deep, open cracks are observed. Ruts and pot holes caused by parked aircraft are seen. These failures indicate a weak subgrade and subbase course.

d) Terminals:

1) Passenger Terminal: The present commercial passenger terminal at Kimpo is basically a two story concrete framed structure 150 meters by 58 meters in overall dimension. The only multi-story portion of the building is the control tower shaft. The terminal, which has been constructed in several stages, serves all domestic and international passenger handling functions. In addition to this function, there is a ROKAF terminal facility, offices for the airport customs staff, airline offices (KAL and JAL), and offices for those officials of the Ministry of Transportation responsible for the administration and operation of the airport.

On the tenth floor of the multi-story portion of the building is the air traffic control tower, from which all VFR traffic control is conducted. The nineth floor is used as equipment room for the tower.

An ASR-5 radar was installed at Seoul. It was equipped with SSR. An IFR room is on the eighth floor of the Terminal building. The six and seventh floors are used as equipment room. After the new IFR was commissioned, it assumed the ATC fuctions which were conducted from the GCA trailer complex in the middle of the airport.

2) Air Cargo Terminal: The present air cargo facilities consist of an assortment of ten buildings concenturated in the northeast section of the airport. The approximate area these facilities occupy, including administrative areas, is 4,000 square meters.

3) NAVAIDS: All air navigational aids required for IFR operations at Kimpo International Airport are installed; VOR, ILS, TACAN, PAR, NDB, and etc.

ILS and PAR are available for approaches to Runway 14. IFR arrivals are cleared to depart on Seoul VOR on the 290° radial. Heavy jets are turned to start their base leg about 8 miles out, turning to a heading of 050° between 10 and 12 miles from the airport. Meanwhile, when they have passed the 290° radial of the Seoul VOR between 7 and 13 miles out, they are descended for PAR or ILS approaches. The airfield lighting system is adequate for Category I certification.

4) Ground Equipments: Fire fighting and rescue services at Kimpo are available for 24 hours.

Section II Necessity of the Project

1. Background of the Project

The rapid growth of commercial aviation in the past decade has presented major problems in providing airport facilities adequate to meet current demands. The impending introduction into scheduled service of a new generation of jet aircraft, including Lockheed 1011 and McDonnel-Douglas DC-10 will add to the problems of ground support facilities. The impact of the Boeing 747 has already been felt. Every nation of the modern world is now faced with the immediate need to expand its airport facilities, particularly those serving international schedules, to meet current and further demands.

Kimpo, a major international airport of Korea, is the center of commercial aviation within the Republic. In addition, it is one of the Orient's major air centers, serving as gateway to the nation and to the capital city of Seoul. International flag carriers, including Korean Air Lines, link Kimpo to the adjacent capitals of the Orient and Southeast Asia, as well as to European and North American continents.

Domestic route structure is also based on operation to and from Kimpo International Airport. Kimpo is the physical heart of Korea's civil aviation activity.

The history of the Kimpo site has not been one of peace. Construction of facilities at the Kimpo site was begun by Japanese occupying forces in 1936. It was not until 1945 that the works came under Korean control. Improvement of infrastructure works was continued by the Korean government.

War again intervened in 1950, when most of the facilities at the Kimpo site were totally destroyed. Korean and U.S. forces finally re-occupied the airfield in early 1951, and rehabilitation of Kimpo was begun. By 1952 the airport had been sufficiently rebuilt so that it could again be regularly used by commercial aircraft. In the same year Korea became a participating member of ICAO (International Civil Aviation Organization). From that period to the present there has been almost constant expansion and improvement of the facilities at the Kimpo site. Among the first of the major programs began was a series of joint projects by the Korean government and USOM (U.S. Operational Mission). This effort involved general improvements and extension of facilities, with special emphasis on aeronautical safety. In 1960 a five-year development plan was instituted to further the expansion and improvement of six major Korean airports, including Kimpo International. This nationwide program was broad in scope.

Studies made by various groups during the mid-1960's contributed further to the development of Kimpo. One of these, made by the U.S. Corps of Engineers in 1965, dealt with the runway and taxiway system and the extension and augmentation thereof. Another study by the U.S. architectural and engineering firm, Smith, Hinchman and Grylls, covered a broader range, including activity forecasts, terminal expansion and general improvements. All of the later studies were concerned solely with Kimpo International Airport.

2. Necessity of the Kimpo Expansion Project

The dramatic growth of air transport in the last decade makes a study of a single isolated facility no longer as pertinent and definitive as has been true in the past.

An airfield of any magnitude whatsoever is no longer an isolated entity. It is a part of a regional or national air transportation system which is no longer a separate thing. It is an inseparable part of a national global transportation system involving inter-related air, sea and land modes.

In the early part of the year of 1971, the government of the Republic of Korea, recognizing the need for a coordinated long-range development plan for its total transportation system, commissioned a series of related transportation studies. Among these was a study to determine the immediate and long-range commercial aviation facilities requirements for the Seoul region. Airways Engineering Corporation of Washington,D.C. was selected, as a Consultant to the Ministry of Transportation, to conduct this study.

A firm and clear knowledge of the intent and scope of such a study was required in order to analyze, evaluate and implement the findings and recommendations of that study. The scope of this study can be stated simply. The Consultant was required to determine by forecast the nature and extent of the aeronautical activity demands of the Seoul metropolitan region for the time period from 1970 to 1990.

Based on these determinations the Consultant was required to examine and evaluate the alternates available to provide the facilities required to satisfy these demands. These alternates range from, (1) the total expansion of Kimpo to meet these needs, if such is technically possible and economically feasible, through (2) the establishment of a second airport to augment Kimpo, to (3) the complete replacement of Kimpo with a totally new airport.

The possibility of the use of an existing military airfield was also explored, as well as the shifting of current military operations at Kimpo to other sites.

In addition to a knowledge of the scope of this study, it was necessary that the techno-economic bases and restraints affecting the study be appreciated. These bases and restraints were not imposed by the government. They were matters of terrain, operational efficiency, economics, military restrictions and accepted ICAO, IATA and FAA criteria.

The investigation conducted by AEC indicated that the most feasible course of action for the Government of Korea is to develop the Kimpo site to its fullest extent.

In order to meet 1990 forecast requirements the expansion involves, as the major elements, the following entitled Kimpo airport full expansion project in their full 1990 configuration:

a. a new closely spaced parallel runway
b. a full length parallel taxiway
c. expanded apron space
d. expanded passenger terminal facilities
e. a consolidated cargo facility
f. additional navigational aids
g. obstruction removal.

This concept is based on the removal, over the next two to five years, of all USAF facilities, and the on-site relocation of ROKAF facilities to allow for the recommended parallel runway.

Section III Project Description

In order to schedule planning, make construction financing more acceptable to lending institutions, and to minimize the possibility of unwarranted financial burdens, the expansion program is suggested in two stages. The approximate time periods would be such that an immediate expansion program to be completed by 1975 would provide airfield facilities adequate to 1978 and terminal/apron facilities adequate to 1980-82. A second program, designed to be placed in full operation by 1978 would provide the additional capacity required for forecast needs through 1990.

1. Stage I

The first construction program would include these items:

A. Airfield work

Full parallel taxiway, all required repair of existing pavements, new apron space, runway and approach lighting and NAVAIDS required to meet ICAO Category II criteria.

Subject to more detailed refinement during Master Planning, the scheduling of major improvements involved in the first program should include the following to meet the forecast demand.

(1) Full parallel taxiway for commercial operation to provide a single runway IFR peak hour capability of 40 operations per hour which is expected by 1978. To meet the increasing demand, which exceeds the existing runway-taxiway system capability of 30 operations per hour, the full parallel taxiway should be operational by the year 1975.

(2) Apron space improvements and expansions must be planned and completed by the year 1975 to serve until 1980-82.

B. Terminal facilities

Present Terminal expanded to handle domestic and international traffic through 1975 or domestic traffic only through 1980, whichever area requirements is the larger, plus a new international terminal to be completed no later than 1975 and be capable of accommodating 1980 traffic.

C. Obstruction Removal

Lowering of hills at the southeast and lowering or relocation of a power line in that vicinity shall be done. This would permit establishment of a 50:1 approach surface to Runway 32. It should then be possible to commission an increase airport capacity by eliminating the need of any circling approaches. It would also permit the use of lower weather minima for all ILS approaches to Kimpo. The material to be disposed from further lowering of the hills immediately at the southeast of the airport could be used for an additional runway and taxiway as borrow fill. It should be completed no later than 1975.

D. Miscellaneous

The required roadwork, parking facilities, exterior utilities to support this first program, including land acquisition of approximately 125 hectares of land and approximately 2 million cubic meters of fill.

The construction cost of this first increment of the expansion of Kimpo is estimated at approximately US$34.944.700 including engineering fees, government administrative costs and contingency allowances.

2. Stage II

The second construction program, intended to raise Kimpo's capacity to 1990 requirements, would include airfield work to be completed in 1978 and terminal facility improvements to be completed no later than 1980-82. A description of the recommended Stage II work is as follows:

A. Airfield Work

A second closely spaced parallel runway complete with required lighting, grading, drainage and marking, together with the apron expansion.

Based on forecast requirements, the parallel runway will be required by 1978-80, depending on the military activity and scheduling. However, the parallel runway should be completed by 1978.

B. Terminal facilities

The expansion of the newer international facility to accommodate 1990 volumes, and the further expansion (if required) of the present terminal to satisfy 1990 domestic passenger forecasts and the construction of a consolidated cargo terminal to handle all cargo.

C. NAVAIDS

The installation of an ILS for Runway 32.

The new ILS glide slope for Runway 32 should be an improved type, such as the recently developed one by the Electronics Research Laboratories of the Technical University in Trondheim, Norway. This glide slope is now commercially available, and is being ordered by the Norwegian Government to replace all their present ILS glide slope.

Stage II costs have been estimated in current U.S. dollars and amount to $30,010,700. Further refinements of these estimates will be included in the master planning phase of this study.

Two Staged Kimpo Expansion Program

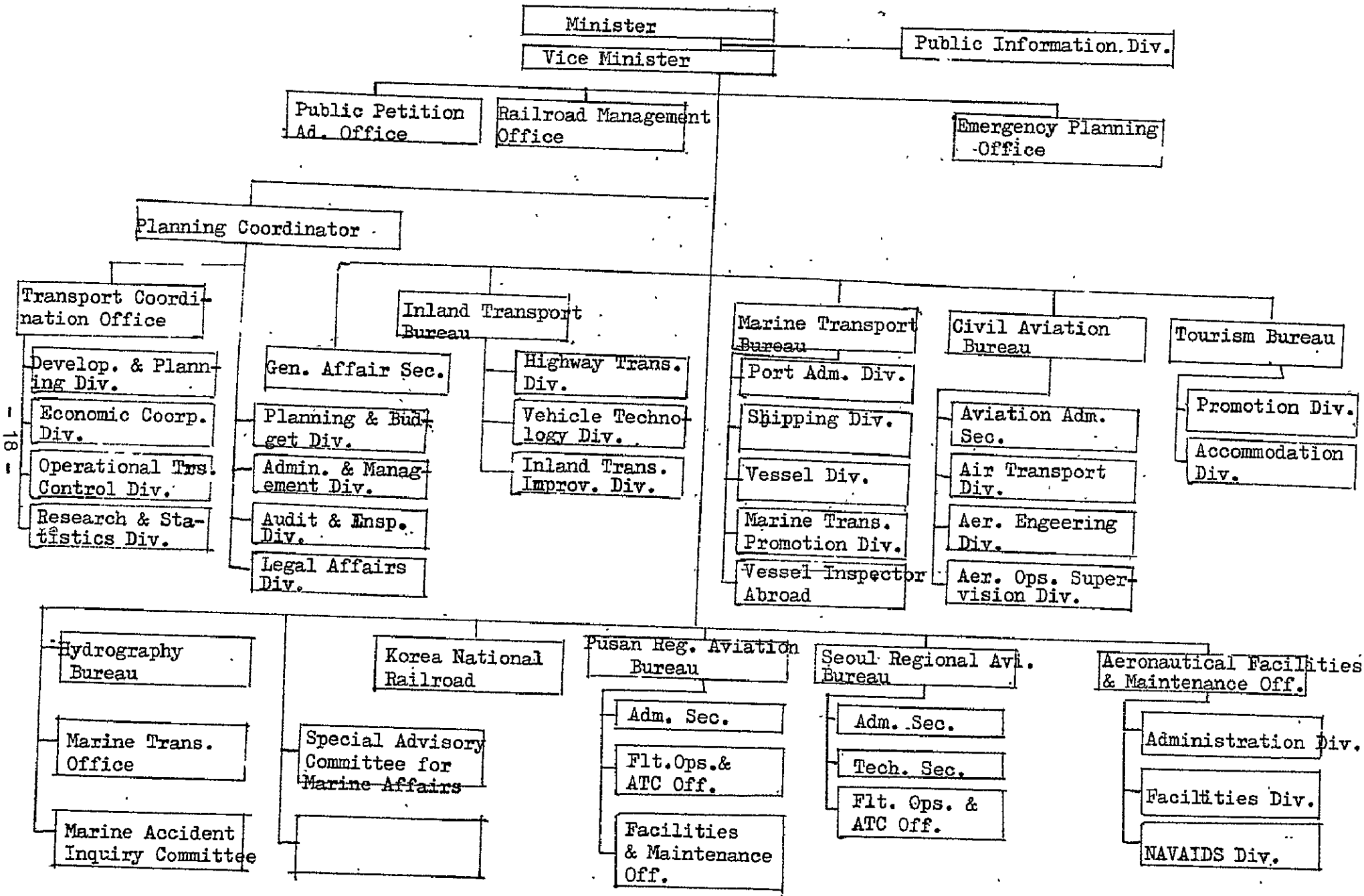
Stage	Project	Year					Remark
		72	73	74	75		
I	Establishment of Budget	—					
	Master Planning	—					
	Present Runway & Apron Space Improvements		—	—			
	Parallel Taxiway		—	—	—		
	Construction of New Terminal Building			—	—		
	Miscellaneous		—	—	—		
	Cost	US$34.944.700.00					
		76	77	78	79	80	
II	Parallel Runway	—	—	—	—	—	
	Completion of Terminal Building.	—	—	—	—		
	Cargo Terminal		—	—	—	—	
	Miscellaneous (NAVAIDS, etc.)	—	—	—	—	—	
	Cost	US$30.010.700.00					

Section IV Organization of Project Sponsor

A table of organization for the Ministry of Transportation is included here as per attached. This chart shows the executive structure of the Ministry as well as the major departments as their organization.

As shown below, in establishing the master plan of the Kimpo International Airport Development Project, the Civil Aviation Bureau will provide bugetary planning for the project, and the Seoul Air Navigation and Facilities Office/Kimpo will carry out the full development of the Kimpo site to satisfy all forecast commercial needs through 1990.

ORGANIZATION CHART OF MINISTRY OF TRANSPORTATION



Section V - Financial Aspect

1. Funds Requirements

The estimated total cost of the project shall be US$27,240,200 and local currency W14,143,200,000 Won respectively.

The Won currency 14,143,200,000 shall be supplied by applicant for domestic materials and equipments and labor, etc., and the foreign currency US$27,240,000 shall be obtained from the proposed loan source.

2. Construction Cost

The construction cost of Kimpo Airport Expansion Project is as follows:

Preliminary Cost Estimate

A. Kimpo Cost

Item Description	Cost (1000US$)	Foreign Exchange (1000US$)	Local Currency (1000US$)
1. Clearing & Grubbing	2.002.		750.
2. Excavation	606,000.	1.000	1.875.000.
3. Drainage	150.	20.	48.750.
4. Pavement (new PCC)	7.144.5	1.100.	2.266.687.
5. Pavement (replacement PCC)	1.850.	270.	592.500.
6. 15 cm Bitumious Overlay	448.	65.	143,625.
7. Car Parking	560.	75.	181.875.
8. Interior Roads	560.	75.	181.875.
9. Access Road Overpass	120.	15.	39.375.
10. Sewage Disposal System	80.	48.	12.000.

11. Water Storage & Distribution	155.	85.	31.875
12. Fire Protection System	37.	22.	5.625
13. Heating Plant Equipment	100.	80.	7,500.
14. Telephone System	500.	38.	4.500.
15. Airfield Lighting	120.	72.	18.000.
16. Airfield Marking	40.	20.	7;500.
17. In Runway Lighting	375.	245.	48.750.
18. Approach Lighting	260.	104.	58.500.
19. Navaids & Communications	1.000.	650.	131.250.
20. Outside Electrical Utilities	260.	104.	58.500.
21. Auxiliary Standby Generator Equipment	85.	68.	6.375.
22. Air Cargo Facility	1.728.	600.	423.000.
23. Domestic Terminal Building (1990 Capacity)	8.540.	3.560.	1.867.500.
24. International Terminal Building (1990 Capacity)	12.320.	5.300.	2.632.500.
25. International Terminal Ramp	350.	263.	32.625.
26. Fencing	73.2	73.2	
27. Canal Culvert	2.000.	500.	526.500.
28. Land Acquisition	3.750.	3.750.	
	48.157.7	18.202.2	11.233.312.5
+ 10% Contingencies	4.943.	3.673.	476.250.
	52.973.7	21.875.2	11.709.562.5
+ 10% Engineering and Administration	5.297.	3.873.0	486.375.
KIMPO SUBTOTAL	58.270.700		
		25.748.200	
			12.195.937.500

B Kimpo ROKAF Costs

Item Description	Cost (1.000US$)	Foreign Exchange (1000US$)	Local Currency (1000US$)
1. Demolition	50.		18.750.000
2. Clearing and Grubbing	1.1		412.500
3. Excavation	450.		168.750.
4. Drainage	70.		26.250.
5. Pavement-Taxiways & Apron	2.310.		866.250.
6. Interior Roads	120.		45.000.
7. Sewage Collection System	12.		4.500.
8. Water System	30.	20.	3.750.
9. Fire Protection System	5.		1.875.
10. Telephone System	35.	25.	3.750.
11. Airfield Lighting	40.	30.	3,750.
12. Electrical Distribution	100.	60.	15.000.
13. Auxiliary Standby Power	10.	7.	1.125.
14. Buildings	1.520.	650.	327.375.
15. Fencing	21.6		8.100
16. Railroad Relocation	75.		28.125.
17. Land Acquisition	675.		253.125.
	5.524.7	792.	1.774.762.5
+ 10% Contingencies	552.	300.	94.500.
	6.076.7	1.092	1.869.262.5
+ 10% Engineering and Administration	608.	400.	78.000.
KIMPO ROKAF SUBTOTAL	6.684.7	1.492.	1.947.262.5
KIMPO SUBTOTAL	58.270.7	25.748.2	12.195.937.5
Total	64.955.4	27.240.2	14.143.200.0

Section VI Aviation Demand

1. Introduction

The expansion of an existing airport or the concept and design of a new airport must be based on a series of forecasts of the various peak period demands which must be satisfied by the airport facilities.

For the layout of the airfield itself (runways, taxiways and parking aprons) it is necessary to know, under peak traffic conditions, how many operations per hour the airfield must be capable of handling.

In addition it must also be known how many aircraft will be on the ground (parked) at peak hour, and, of these aircraft, what is the "aircraft mix." At Seoul it is also necessary to know the number and mix of aircraft which will be parked over night, since this is the home base of Korean Air Lines.

Passenger terminal design, whether it will be the design for the expansion of an existing building or a completely new terminal, is a function of the number of people which must be efficiently accommodated at peak hour. This includes passengers, airport employees in all categories, and visitors.

Further, it is necessary that the peak hours passenger totals be sub-divided into international and domestic grouping, and these groups must be further sub-divided into arrivals, departures, and those passengers who are in transit. Additionally, there should be forecasts made for automobile parking requirements, for both passengers and visitors, and for airport staff and employees. Public transportation types and volume must be estimated.

2. The Role of the Kimpo Airport

a) Geographical Relationship of the Kimpo Airport to the International Air Route Network

Kimpo Airport is the most important gateway to Korea. On the international scene, aviation has become a means of mass transport. Today, the role of air transportation in a national economy has become overwhelmingly important. The location of an international airport, therefore, has much bearing on attracting foreign tourists, not to speak of the development of aviation.

Regularly scheduled direct non-stop international flights exist for 3 routes, Hong Kong - Kimpo, Tokyo - Kimpo and Osaka - Kimpo. For visitors to Korea, these regular flights constitute through services that are reasonably convenient.

Kimpo is situated on the top of the triangle formed by Taipei-Kimpo-Tokyo route. Therefore, a person traveling from the U.S. to Hong Kong via Tokyo or vice versa is least likely to stop in Seoul, because Kimpo is not on such a route. This has been one of the prime factors in dampening the growth of tourism in the Seoul region.

There are two other international airports in Korea located near the city of Pusan and the other on Cheju Island. Activity at these two airports directly affects traffic in the Seoul area.

b) The Role of Kimpo Airport in the Domestic Airline Network

Kimpo is a gateway not only to Seoul but also to areas surrounding it. As Seoul is Korea's principal center of transportation, politics, business and culture, so Kimpo is the principal center of aviation in Korea. Kimpo may well be called the aerial capital of Korea. Almost all air routes in Korea originate there.

Growth of Korean International Air Passenger and Freight Movements

(1963 - 1970)

Year	Pass. No.	Growth Rate	Frt. Qty. (million Kg)	Growth Rate
1963	48.813		.64	
1964	60.692	24	1.01	57.8
1965	77.492	27	2.41	138.6
1966	131.369	69	4.20	74.3
1967	175.750	34	5.63	34.0
1968	228.019	29	9.37	66.4
1969	267.437	17	13.60	45.0
1970	360.000	32		34
Avg. Growth Rate Per Year		33%		69.4 %

Historic Growth of Domestic Airlines

(1963 - 1970)

Year	Pass. No.	Growth Rate	Frt. Qt. (kg)	Growth Rate
1963	94,036		524,908	
1964	174,925	86	871,627	66
1965	207,664	19	826,913	-5
1966	197,607	-8	986,860	19
1967	215,171	12	1,431,729	45
1968	312,136	45	1,722,828	20
1969	619,470	98	2,795,190	62
1970	934,935	45	3,501,918	25
Yearly Average Growth Rate		42 %		33 %

Section VII - Kimpo Forecast

The principal determinant of future airport system requirements is the amount of aeronautical activity that will be generated in the metropolitan area. Forecasts of aeronautical activity, therefore, form the basis of facilities planning for future requirements.

The basic ingredient of a sound and unified approach to forecasting is a common-sense analysis of the important forces that account for air transportation demand. Socio-economic analysis of the metropolitan area helps to answer the basic questions regarding the type, location and volume of future aviation demand.

Summary of Forecasted Values

Year	Forecasted Domestic Passengers (1,000)	Forecasted Int'l Passengers (1,000)	Forecasted Domestic Cargo (1,000Kg)	Forecasted Domestic Mail (1,000Kg)	Forecasted Int'l Cargo (1,000Kg)	Forecasted Int'l Mail (1,000Kg)
1975	1600	640	4654	21.7	41203	8015
1980	2300	900	7678	30.3	51413	15470
1985	3100	1150	12214	37.4	69942	24635
1990	2858	1416	17254	48.7	105295	33850
Average Annual Growth Rate	9.1%	8.0%	9.1%	5.6%	8.8%	10.1%

1. Aircraft Operations

Projected Total Annual Aircraft Operations
for Kimpo Airport - 1970-1990

	Year	Pax. No. (000)	Avg. A/C Capacity (Passengers)	Avg. L/F (%)	Total Annual A/C Operations (000)
DOMESTIC	1975	1600	47	.60	56.7
	1980	2300	51	.60	75.2
	1985	3100	54	.60	95.7
	1990	3858	59	.60	109.0
INTERNATIONAL	1975	640	97	43	15.3
	1980	900	104	40	21.6
	1985	1150	114	40	25.2
	1990	1416	118	40	30.0

2. Peak Hour Aircraft Operations

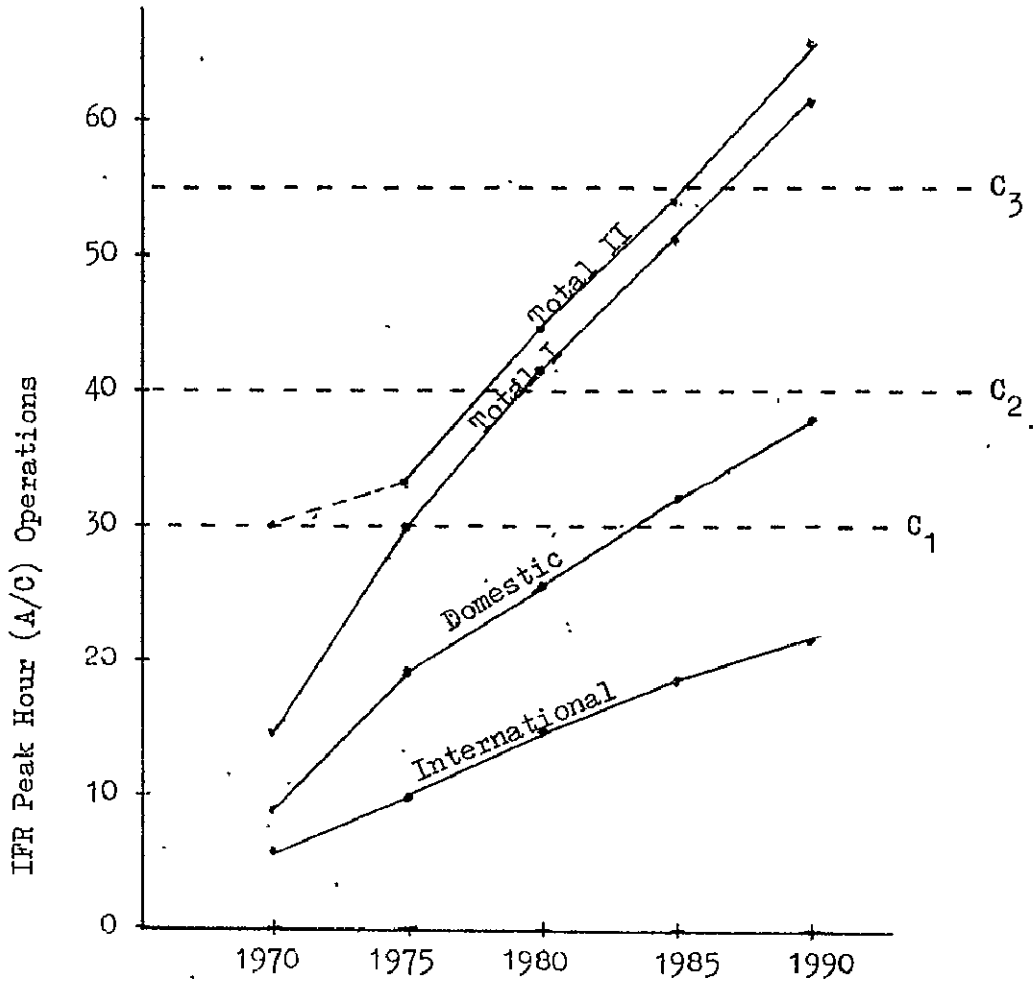
Projected 90th Percentile Peak-Hour Aircraft Operations for Kimpo
(1970 - 1990)

Year	Total Annual Ops. (000)	90th Percentile Peak Hr. Ops.	Domestic	Int'l
1970	35.8	15	9	6
1975	72.0	30	19	11
1980	96.8	41	26	15
1985	120.9	51	32	19
1990	139.0	59	37	22

3. Present Airfield Capacity and Expected Demand

The present runway system at Kimpo Airport has an hourly IFR capacity of 30 aircraft operations per peak hour. Adding a parallel taxiway would bring the peak hour IFR capacity to 40 aircraft per hour, and the addition of a second closely spaced parallel runway would raise the combined IFR peak-hour capacity to 55 aircraft operations per hour. A graph of the Kimpo peak-hour projection to 1990 is shown in Figure below.

Kimpo Peak Hour Projections



1. C_1 = Existing Runway Acceptance Capacity (IFR).
   C_2 = Existing Runway Acceptance Capacity with Added Parallel Taxiway
   C_3 = Dual Runway Capacity (IFR)

a) Aircraft-associated Delays at Kimpo

The average annual single runway facility in the United States can accommodate 140,000 mixed IFR and VFR operations annually. This is based upon a facility with at least two runway exits midfield and a parallel taxiway. The mixed IFR/VFR peak-hour capacity for such a single runway facility is 44 operations per hour.

However, primarily because of the taxiway problem and certain air traffic control situations, the annual practical capacity of Kimpo has been reduced severely by 50 per cent.

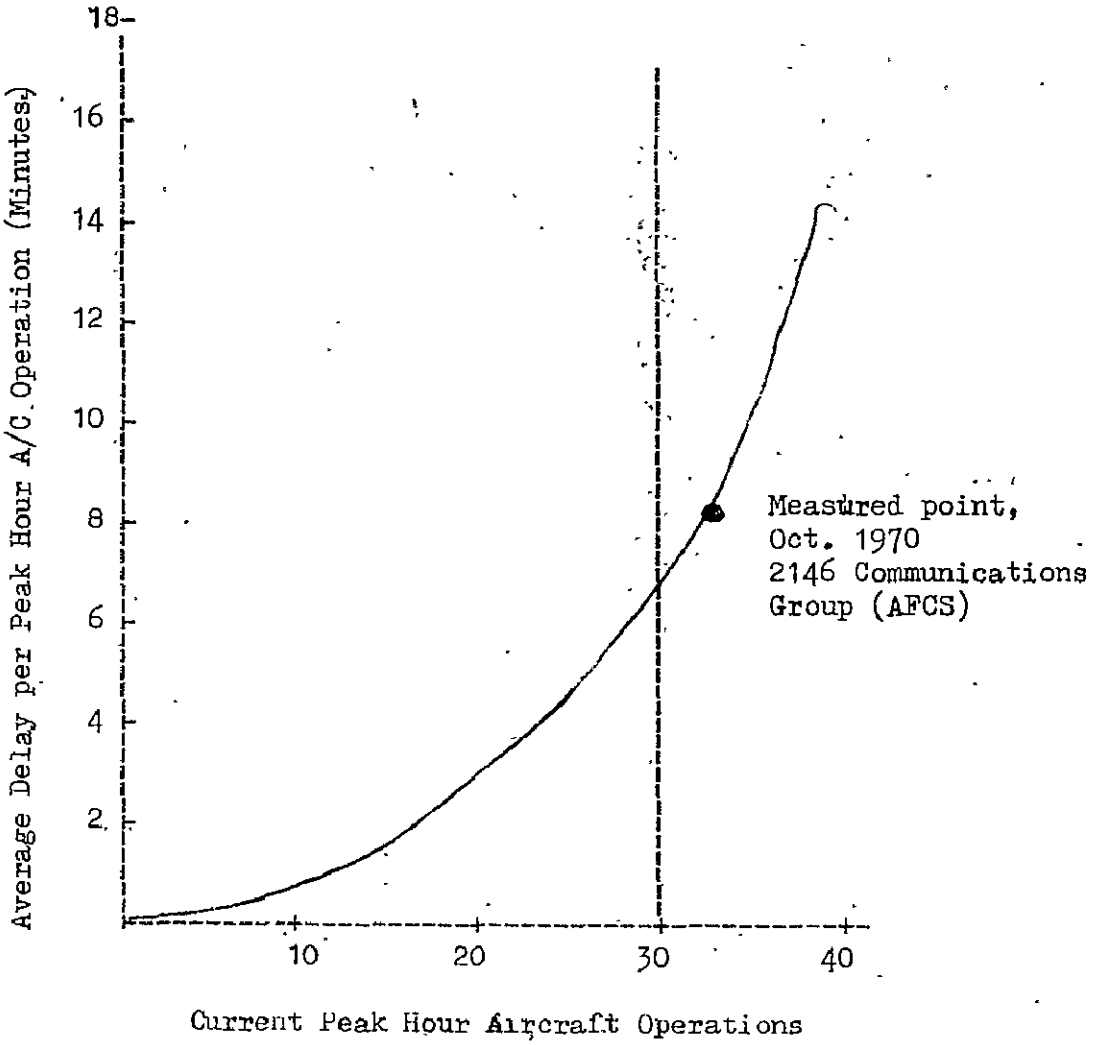
Present facilities will reach saturation at 70,000 operations annually (saturation is defined as that point at which departing aircraft are delayed for more than four minutes during two consecutive peak-hour periods.). This 70,000-operations capacity level does not mean that Kimpo cannot handle more aircraft. It means that under present conditions increased operations will encounter rising delays (assuming no peak-hour smoothing through traffic rationing, differential landing fees, etc.).

Thus, if the airfield accommodates the total projected 1990 aircraft operations, it will be able to do so only at the expense of the users, who will experience very serious declines in the quality of service for flights into Kimpo.

However, it was pointed out that the major Kimpo systems which are sources of delays are the air terminal building, airspace and access capacities.

Current Average Peak Hour Departure

Delays at Kimpo as a Function of Peak Hour Operations



*Assumptions; 1. No peak hour traffic management.

2. IFR/VFR mix 70%/30%.

Table below summarizes the projected aircraft and departure delays which can be expected at Kimpo Airport for two different cases: (1) without improvements; and (2) with improvements.

Projected Average Annual Aircraft Delays

(with and without Improvements)

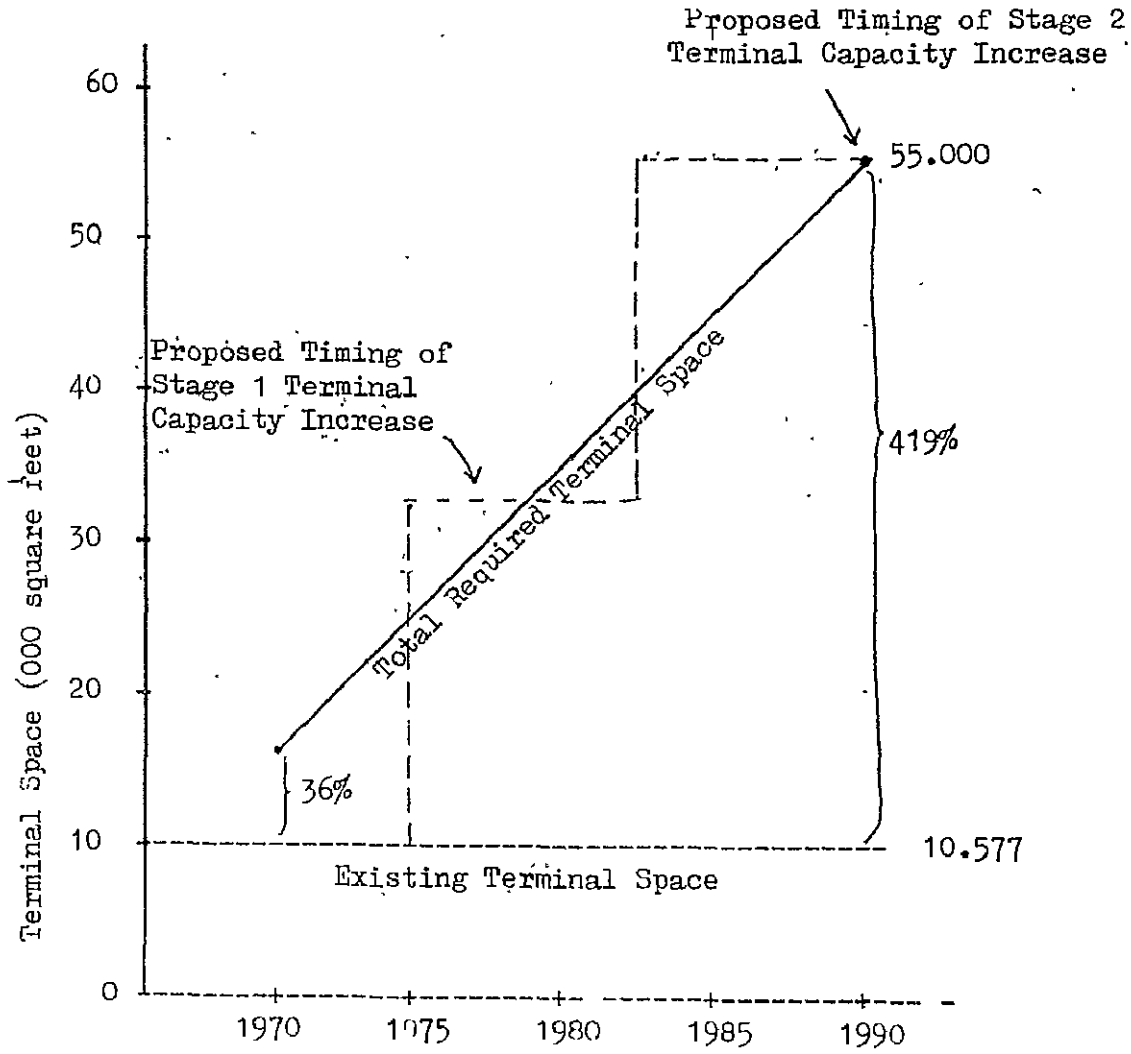
Year	No Improvements			Improvements			
	Kimpo Capacity in Ops/Yr.	Proj.Traffic in Ops/Yr. (with Mil.)	Total Delay (Min/Yr.)	Kimpo Capacity in Ops/Yr.	Proj.Tra. in Ops/Yr. (with Mil.)	Total Delay (Min/Yr)	Delay Time Saved
1975	70.000	90.000	230.000	94.000	90.000	120.000	110.000
1978	70.000	105.000	350.000	160.000	105.000	50.000	300.000
1980	70.000	115.000	500.000	160.000	115.000	80.000	420.000
1985	70.000	139.000	750.000	160.000	139.000	150.000	600.000
1990	70.000	157.000	100.000	160.000	157.000	230.000	870.000

Improvements include: 1. New Parallel Taxiway - 1975
2. New Parallel Runway - 1978

b) Terminal Processing Delays

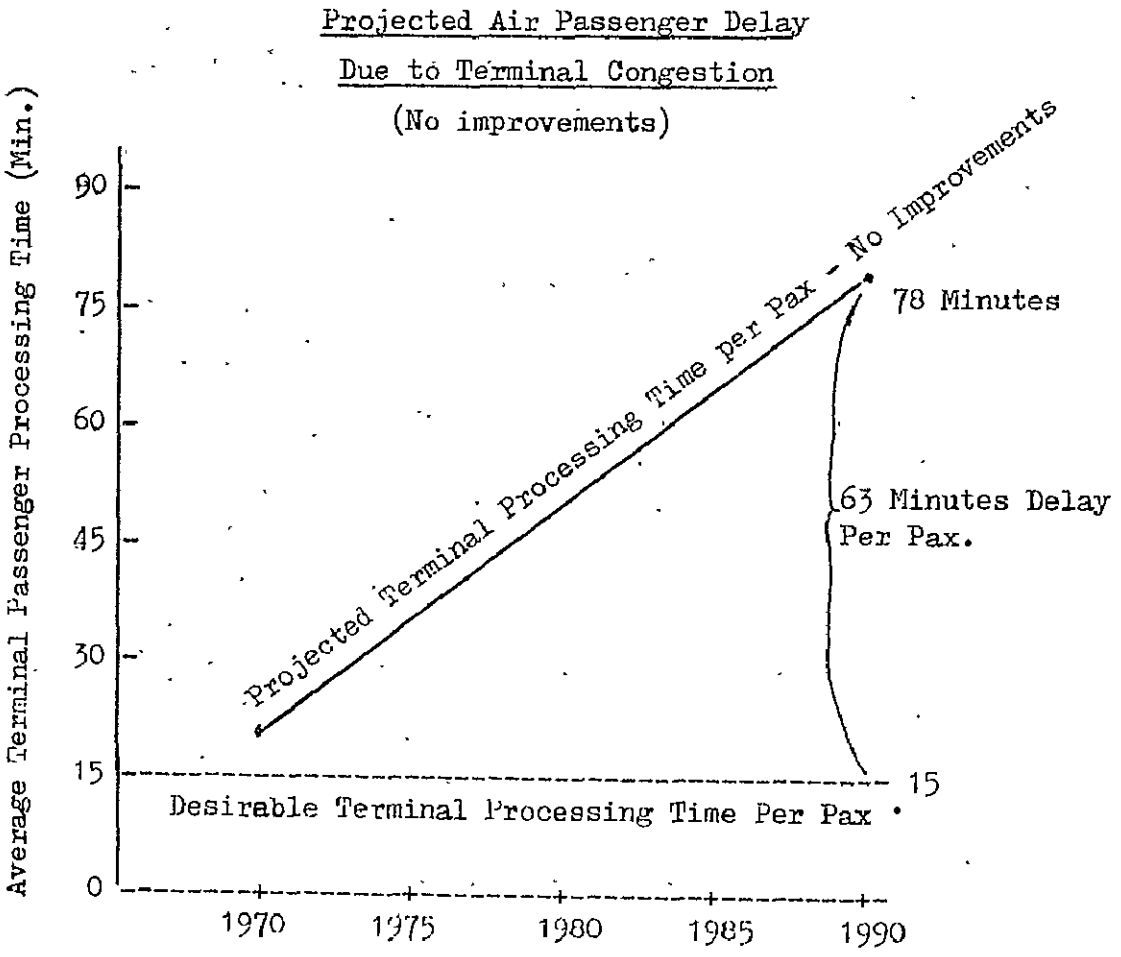
The present terminal area facilities are 36 per cent below the required space necessary to provide a desirable and efficient level of service for enplanning and deplaning passengers.

Projected Deficiencies in Total
Kimpo Airport Terminal Space



Assuming that the desired level of service during terminal airport processing is 15 minutes, it was possible to calculate the additional minutes of delay caused by insufficient terminal space.

This was accomplished by taking space required for terminal processing as a proxy measure for time consumed, since it is expected that the space available for processing passengers is proportional to the time required to process them. Using this reasoning, the projected air passenger delays due to terminal congestion was approximated.



Section VIII Justification of the Project

The justification of the Project has been developed using total B/C by estimating and comparing total benefits and costs for all purposes. The phased feasibility studies show the project to be economically feasible.

1. Cost Impact

Three alternative approaches were selected for engineering cost analysis after completion of preliminary field investigations of the various possible airport sites. The final three alternatives chosen for further analysis are equal capacity solutions, each capable of providing the necessary capacity increases required to accommodate forecast 1990 aviation demand. These alternatives were:

Alternate A: The full expansion and development of Kimpo Airport.

Alternate B: The partial expansion of Kimpo and the development of a second supplemental airport.

Alternate C: The development of an alternate site to completely replace Kimpo.

Preliminary economic evaluation of these sites indicated that the flow of benefits from each would be approximately the same since each alternative was designed to handle the projected traffic. Furthermore, it became clear that the major differences between the three alternatives were primarily related to the associated construction costs. Table below summarizes these figures.

Alternate A:	1990 Total Cost	$ 64,955,400
Alternate B:	1990 Total Cost	$122,091,723.
Alternate C:	1990 Total Cost	$155,108,751.

2. Benefit Impact:

Based upon the above cost estimate, it was recommanded that the Government of the Republic of Korea be select Alternative A as the one which would offer the most cost-effective solution for providing the added capacity to accommodate 1990 forecast demand.

In addition, because the equal-capacity alternatives were all conceptualized to accommodate 1990 forecast aviation demand, the benefits for all three were approximately the same. Thus, costs were the prime consideration in determining which alternative to investigate and develop.

Alternate A was chosen and the following primary factors were selected for benefit-cost evaluation of the project (with and without Kimpo expansion):

Direct Benefits:

Aircraft Operating Costs Savings (1975-1990): US$5,779,800.
Passenger Time Savings (1975-1990): US$22.317.000.
Aircraft Utilization Savings (1975-1990): US$3.900.000
Tourism - Foreign Exchange Benefits (1975-1990): US$5.100.000
Land Value Increases (1975-1990): US$4.200.000
Increased Employment Benefits (1975-1990): US$2.300.000
Increased Airport Aviation Revenues (1975-1990): US$400.000

Direct Costs:

Investment Costs
Added Airport Operating Costs

a) Aircraft Operating Costs Savings

Benefit Due to Aircraft Operating Cost Savings

Year	Delay Time Saved (min/yr)	% Domestic	Domestic Delay Saved (min/yr)	Unit Value of Domestic Delay Time ($/min)	Total Value of Domestic Delays Saved ($)
1975	110.000	63	70.000	4.4	300.000
1980	420.000	63	265.000	4.7	1.245.500
1985	600.000	63	378.000	4.9	1.852.200
1990	870.000	63	548.000	5.2	2.849.600

% Int'l	Int'l Delay Saved (min/yr)	Unit Value of Int'l Delay Time ($/min)	Total Value of Int'l Delays Saved ($)	Total Value Dm. & In. Delays Saved
37	40.000	9.1	370.000	670.000
37	155.000	9.1	1.410.500	2.656.000
37	222.000	9.1	2.020.200	3.872.400
37	322.000	9.1	2.930.200	5.779.800

c) Passenger Time Savings:

Projected Total Benefits Due to
Passenger Time Saved
(Domestic and International)

Year	Domestic (Millions $)	International (Millions $)	Total (Millions $)
1975	1.588	2.579	4.467
1980	3.378	5.365	8.743
1985	5.839	8.792	14.631
1990	9.083	13.234	22.317

d) Aircraft Utilization Savings

Aircraft Utilization Cost Savings

Year	Equivalent Aircraft Lost per Day	Gross Costs per Average Operator Aircraft Day ($/Aircraft/Day)*	Annual Cost Saving due to Avoiding Aircraft Utilization Losses (Millions $)
1975	1	1,800	.6
1980	3	1,800	2.0
1985	4	1,800	2.6
1990	6	1,800	3.9

*Based upon forecast Kimpo Airport aircraft mis (not including profit)

d) Tourism - Foreign Exchange Benefits

Projected Increased Foreign Exchange Earnings from International Air Passengers

Year	Additional International Enplaned Air Passengers Accommodated (000)	Projected Average Foreign Tourist Expenditures ($)	Foreign Exchange Benefit from Additional International Air Passengers (Millions $)
1975	16.0	167	2.7
1980	22.4	159	3.6
1985	28.8	151	4.4
1990	35.4	144	5.1

*Difference between the case with Kimpo expansion as compared with the case without expansion (5% Constraint Factor)

e) Land Value Increases

Land Value Increases Attributable to Kimpo Airport Expansion

Year	Airport Vicinity Land Area (million pyong)	Land Prices*		Difference (won/pyong)	Benefit Added Land Value (million $)
		With Kimpo A/P Expansion (won/pyong)	Without Kimpo A/P Expansion (won/pyong)		
1975	9.4	9,900	9,864	146	4.2
1980	↓				
1985					↓
1990					

*Land Price Growth Rate:
(1) 65.2% per year with Kimpo expansion
(2) 64.4% per year without Kimpo expansion

f) Employment Benefits

Projected Airport Employment Benefits

Year	EMPLOYMENT		Difference	Avg. Annual Salary (1,000)	Benefit in (Millions) $
	With Kimpo Expansion	Without Kimpo Expansion (5% Constraint)			
1975	3,100	2,945	155	3	.5
1980	4,300	4,085	215	4	.9
1985	5,500	5,225	275	5	1.4
1990	7,800	7,410	390	6	2.3

g) Airport Aviatio . Revenues

Kimpo Aircraft Revenue Increases*

Year	WITH EXPANSION			WITHOUT EXPANSION		Revenue Increases due to Kimpo Expansion (millions $)
	Annual Aircraft Ops. (000)	Avg.Revenue per Aircraft Operation** ($)	Annual A/C Landing & Parking Revenues (million $)	Annual A/C Ops.(000) (5% Constaint)	Annual A/C Landing & Parking Revenues (millions $)	
1975	72.0	39	2.8	68.4	2.6	.2
1980	96.8	43	4.2	92.0	3.9	.3
1985	120.9	47	5.7	114.9	5.4	.3
1990	139.0	52	7.2	132.0	6.8	.4

*Commercial Aircraft

**Based upon 2% per year growth from the present $35.00 per aircraft operation

i) Summary of Direct Costs

Summary of Direct Costs -

Full Kimpo Airport Expansion

Year	Investment Costs of Improvements (Millions of $)*	Added Airport Operating Costs (Millions $) **	Total Added Improvement Related Costs (Millions $)	Present Worth Factor to 1971 ***	Total Project Costs Discounted to 1971 (Millions $)
1973	1.5	.08	1.50	0.826	1.24
1974	4.5	.08	4.50	0.751	3.38
1975	9.0	.08	9.08	0.683	6.20
1976	3.2	.16	3.28	0.621	2.04
1977	9.8	.16	9.88	0.564	5.57
1978	19.5	.16	19.66	0.513	10.09
1979	1.7	.32	1.86	0.467	0.87
1980	5.2	.32	5.36	0.424	2.27
1981	10.5	.32	10.82	0.386	4.18
1982	0	.32	.32	0.350	.11
1983	0	.32	.32	0.319	.10
1984	0	.32	.32	0.290	.09
1985	0	.32	.32	0.263	.08
1986	0	.32	.32	0.239	.08
1987	0	.32	.32	0.218	.07
1988	0	.32	.32	0.198	.06
1989	0	.32	.32	0.180	.06
1990	0	.32	.32	0.164	.05
				=	36.540

*Based upon preliminary estimate of construction staging
**Based on estimated 50% increase over present Kimpo operating costs due to proposed facility expansion (1973-1981)
***10% discount rate

h) Summary of Direct Benefits

Summary of Direct Benefits - Full Kimpo Airport Expansion

(Discounted present worth @ 10%)

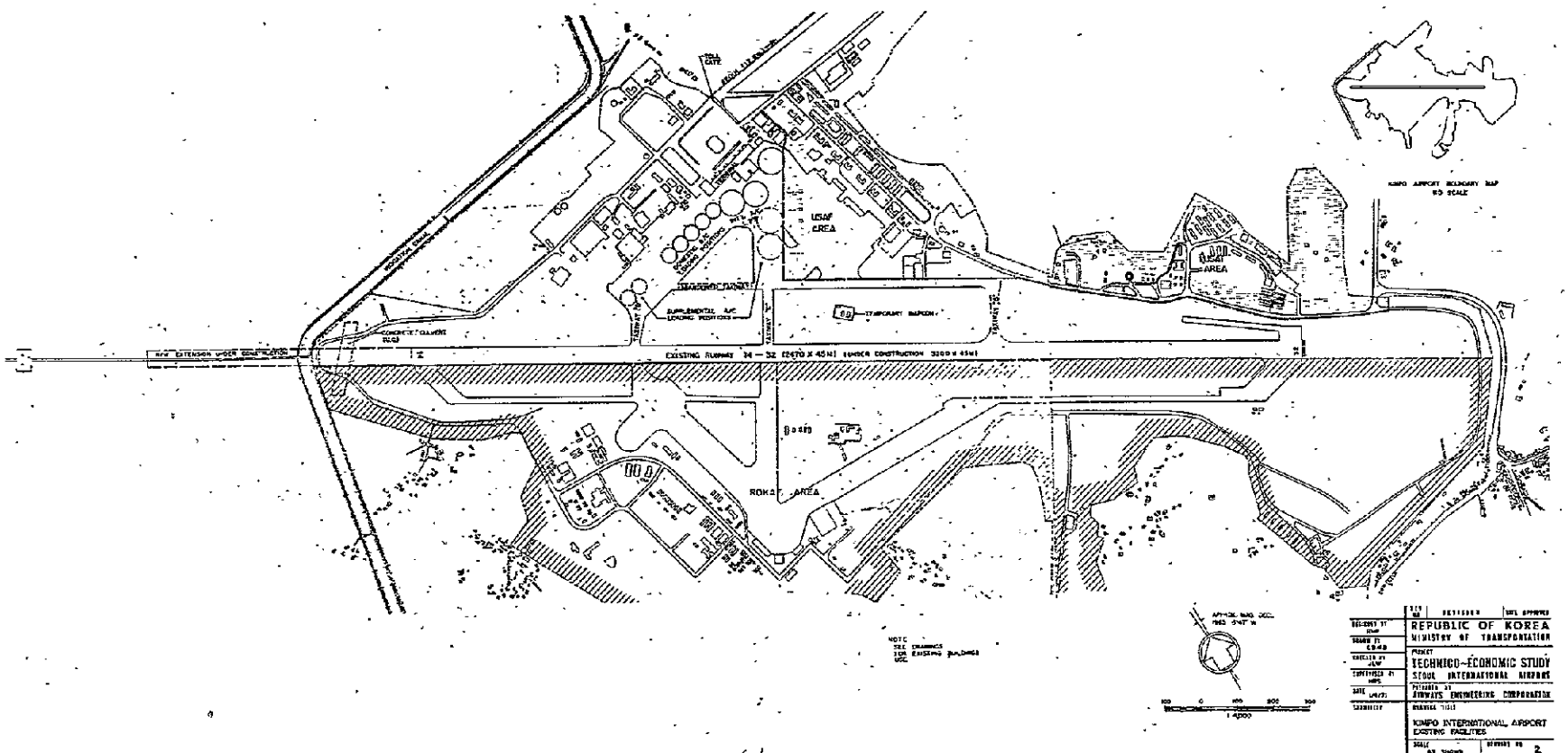
Year	Aircraft Operating Cost Savings (Millions of $)	Passenger Time Savings (Millions of $)	Aircraft Utilization Savings (Million of $)	Tourism-Foreign Exchange Benefits (Million of $)	Land Value Increases (Millions of $)	Increased Employment Benefits (Million of$)	Increased Airport Aviation Revenues (Millions of $)	Total Project Benefits (Millions of $)	Present Worth Factor to 1971	Total Project Benefits Discounted to 1971 (Millions of $)
1975	.670	4.467	.6	2.7	4.2	.5	.2	13.3	0.683	9.109
1976	.838	4.894	.6	2.9		.5	.2	14.1	0.621	8.775
1977	.996	5.797	.6	3.1		.5	.2	15.4	0.564	8.681
1978	1.870	6.643	1.3	3.3		.5	.2	18.0	0.513	9.240
1979	2.177	7.926	1.3	3.5		.5	.2	19.8	0.467	9.248
1980	2.650	8.743	2.0	3.6		.9	.3	22.4	0.424	9.494
1981	2.771	9.811	2.0	3.8		.9	.3	23.8	0.386	9.179
1982	3.050	11.200	2.0	4.0		.9	.3	25.7	0.350	8.977
1983	3.400	12.400	2.0	4.2		.9	.3	27.4	0.319	8.740
1984	3.600	13.600	2.0	4.4		.9	.3	29.0	0.290	8.410
1985	3.872	14.631	2.6	4.4		1.4	.3	31.4	0.263	8.258
1986	4.300	16.300	2.6	4.5		1.4	.3	33.6	0.239	8.003
1987	4.700	17.700	2.6	4.8		1.4	.3	35.7	0.218	7.782
1988	5.100	19.000	3.3	5.0		1.4	.3	38.3	0.198	7.583
1989	5.400	20.500	3.3	5.3		1.4	.3	41.3	0.180	7.434
1990	5.780	22.317	3.9	5.1		2.3	.4	43.9	0.164	7.215

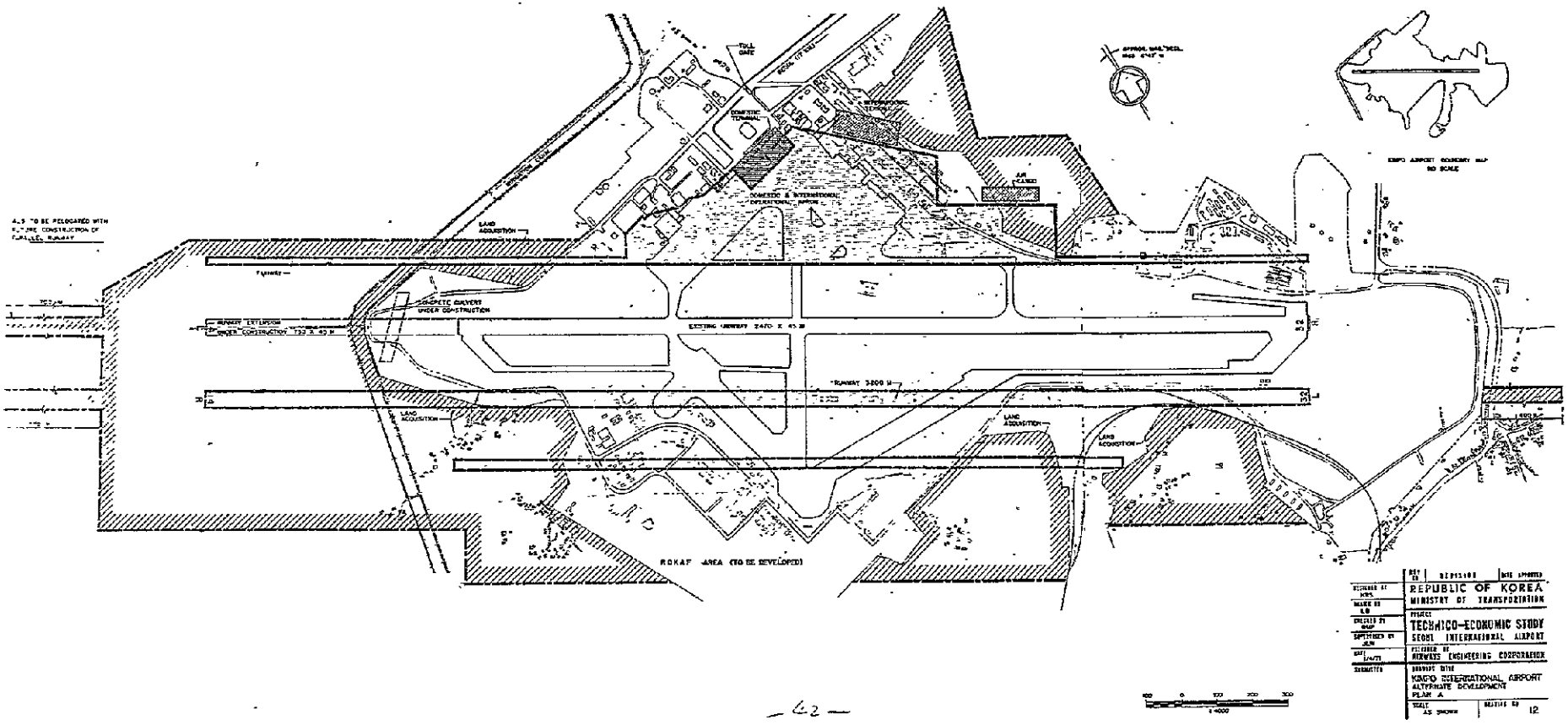
$\sum$ = 135.128

j) B/C Ratio

Kimpo Airport - Alternative A (On-Site Expansion).
Benefit-Cost Ratio

Benefits and Costs	Alternate A
1. Annual present worth of benefits (millions $)	136.128
2. Annual present worth of costs (millions $)	36,540
3. Ratio of Benefits to Costs	3.7


USAF AREA
ROKAF AREA
EXISTING RUNWAY 14 — 32 (2670 X 45M) UNDER CONSTRUCTION 3200 X 45M
TEMPORARY RAMP
REPUBLIC OF KOREA
MINISTRY OF TRANSPORTATION
TECHNICO-ECONOMIC STUDY
SEOUL INTERNATIONAL AIRPORT
KIMPO INTERNATIONAL AIRPORT
EXISTING FACILITIES
AS SHOWN
2


TOLL GATE
DOMESTIC TERMINAL
INTERNATIONAL TERMINAL
AIR CARGO
DOMESTIC & INTERNATIONAL OPERATIONAL APRON
LAND ACQUISITION
TAXIWAY
RUNWAY EXTENSION UNDER CONSTRUCTION 750 X 45 M
HYDRANT CULVERT UNDER CONSTRUCTION
EXISTING RUNWAY 2400 X 45 M
RUNWAY 3200 M
ROKAF AREA (TO BE DEVELOPED)
REPUBLIC OF KOREA
MINISTRY OF TRANSPORTATION
TECHNICO-ECONOMIC STUDY
SEOUL INTERNATIONAL AIRPORT
KIMPO INTERNATIONAL AIRPORT
ALTERNATE DEVELOPMENT
PLAN A